

National Transportation Safety Board

Office of Aviation Safety

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ERA23FA163

WRECKAGE EXAMINATION

May 16, 2023

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A. ACCIDENT

Location: Gainesville, Hall County, GA.

Date: March 25, 2023

Time: 1400

Aircraft: AR-1 gyroplane

Registration: N47AR

B. WRECKAGE EXAMINATION

Investigation Team:

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C. SUMMARY

On March 25, 2023, about 1400 eastern daylight time, an experimental amateur-built AR-1 gyroplane, N47AR, was substantially damaged when it was involved in an accident near Gainesville, Georgia.

D. DETAILS OF THE EXAMINATION

1.0 Accident Site

The accident site revealed that the wreckage of the gyroplane was oriented on a 345° heading. The gyroplane collided with a powerline and came to rest on its side about 100 yards from the powerline. The powerline, which was located

on private property, extended across the gyroplane's presumed flightpath and was at a height of about 50 ft above the ground.

2.0 Airframe Examination

The wreckage was examined and documented at the accident site on March 6, 2023. A follow-up examination on the engine airframe was performed on 5/16/2023 at Atlanta Air Recovery, Griffin, GA.

2.1 Fuselage

An inspection of the gyroplane revealed that the main rotor mast had detached from the fuselage. While the engine and avionics instruments remained intact, they showed signs of impact damage. The tail had separated from the fuselage keel. All flight control surfaces were examined, and continuity of the flight control push/pull tubes to the main rotor mass was confirmed.

2.2 Empennage/Tail

The tail was impact damaged and located about 30 ft in front of the fuselage. The rudder was separated from the tail and located along the wreckage path.

2.3 Rotor Blades

The main rotor mast was partially attached to the fuselage. Both main rotor blades were still partially connected to the rotor head and showed signs of buckling along their entire span. A 20-foot section of powerline was entangled in the rotor head, which had detached from the mast.

2.4 Landing Gear

The fixed main landing remained attached to the fuselage frame. The nosewheel remained attached frame and was undamaged.

2.5 Cockpit

The cockpit was impact damaged, and the flight instrument were impact damaged. Due to postaccident impact damage, the engine control positions at the time of ground impact could not be determined.

2.6 Survivability

The cockpit seats were fitted with 4-point restraints; the seat and restraints were impact damaged.

2.7 Fuel/Fuel System

According to the manufacture, the 17 US gallon aluminum welded fuel tank ensures compatibility with any type of fuel. All three engines are designed to operate on automotive fuel higher than 91 Octane but will also work fine on Avgas (100LL).

The fuel system remained intact, with the fuel cap securely locked in place. The fuel sample drained from the tank was light green in color. A fuel sample defueled from the tank showed a significant amount of water contamination. About 6 gallons of fuel was defueled, and the fuel pumps were activated to remove the remaining contaminated fuel. Water-finding paste confirmed the presence of water. The fuel was placed in a clear container, and visible water was observed after the fuel mixture settled.



Image of water settled in the bottom of the container

3.0 Engine Examination

Examination of the engine confirmed that compression was achieved on all cylinders.

The spark plugs and spark plug caps were visually inspected and tested for functionality both before and during the test run. No issues were detected that would interfere with normal operation, and both the spark plugs and caps were found to be in satisfactory working condition.

The ignition system was visually examined and tested during the test run. No problems were observed, and the ignition system was determined to be in satisfactory working condition.

The float bowls of carburetors were numbered 1/3 and 2/4 based on the cylinder bank that they supply. The 1/3 carburetor float bowl was removed, inspected, and found to be absent of fuel. The 2/4 carburetor float bowl was removed, and a small amount of fuel was found inside. The fuel was tested with water finding paste, and the result was negative. Both carburetors functioned normally during the engine test run.

The lubrication system suffered a breach, resulting in the disconnection of the oil cooler lines. An aftermarket, non-approved Tempest oil filter was found installed. Additionally, the oil tank had detached from the lines and was empty. The lubrication system was partially reinstalled, with the oil cooler excluded.

Both the cylinder and cylinder heads were visually inspected and tested during the engine run. No issues were observed that would affect normal operation, and both components were found to be in satisfactory working condition.

The coolant system experienced a breach, causing the coolant radiator to detach from the engine. During the test run, cold water was circulated through the coolant expansion tank to help maintain the engine's temperature.

The exhaust system was visually inspected and found to be in good condition. It functioned normally throughout the engine test run, with no issues detected.

The gearbox was externally inspected and deemed to be in overall good condition. It operated without any issues during the engine test run, and no problems were identified.

The crankcase was externally examined and found to be in good condition. While the crankshaft was not physically inspected, its continuity was confirmed during manual engine rotation. The crankshaft operated normally during the engine run, with no issues that would affect its performance.

4.0 TEST RUN

Multiple test runs were performed using both fresh and contaminated fuel. During the engine test, all contaminated fuel recovered from the fuel tank was used in the initial test runs. It was observed that when the contaminated fuel was mixed, the engine ran normally until the fuel and water began to separate and settle. Once this separation occurred, the engine would sputter, lose power, and eventually stall. Aside from the fuel contamination, no other issues were found that would prevent normal engine operation.

After draining all the contaminated fuel from the fuel system, clean 100LL AVGAS was added to the tank. The engine started smoothly, requiring only a few propeller rotations when the starter was engaged. The engine continued to run without any issues.

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Submitted by:

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